US006783579B2

(12) **United States Patent**
Pettipiece

(10) **Patent No.: US 6,783,579 B2**
(45) **Date of Patent: Aug. 31, 2004**

(54) **COMBINED AIR CLEANER RESONATOR**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/272,572**

(22) Filed: **Oct. 16, 2002**

(65) **Prior Publication Data**

US 2003/0126841 A1 Jul. 10, 2003

Related U.S. Application Data

(60) Provisional application No. 60/346,912, filed on Jan. 4, 2002.

(51) **Int. Cl.**[7] **B01D 35/00**

(52) **U.S. Cl.** ..... **96/384**; 55/385.3; 55/503; 123/184.57; 123/198 E

(58) **Field of Search** ..... 96/384, 380, 386, 96/388; 55/497, 503, 385.3; 123/184.57, 198 E

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,792,247	A *	8/1998	Gillingham et al.	96/386
5,865,863	A	2/1999	DeSousa et al.	
6,167,862	B1	1/2001	Powell et al.	
6,299,661	B1	10/2001	Bloomer	
6,309,451	B1	10/2001	Chen	
6,530,984	B2 *	3/2003	Stuart	96/380

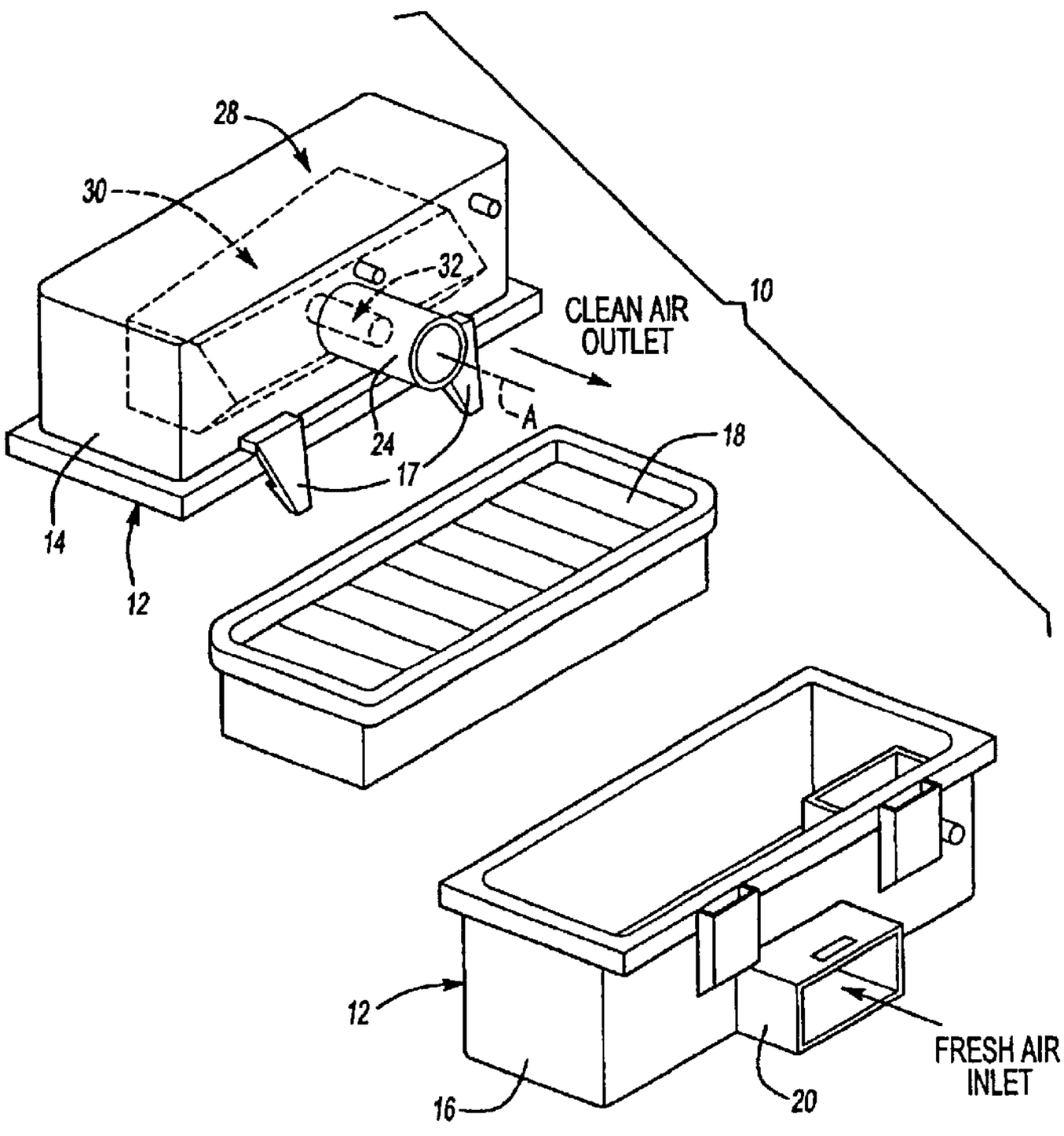
* cited by examiner

Primary Examiner—Robert A. Hopkins

(57) **ABSTRACT**

An air cleaner assembly **10** includes a filter located within a housing **12** between an air inlet **20** and outlet **22** for filtering airflow therebetween. The air inlet **20** extends from the housing **12** to communicate with an air intake port located at a vehicle location where fresh air is available. A resonator device **28** is mounted within the housing **12**. The resonator device **12** includes a resonator volume **30** and a tuning neck **32**. The resonator volume **30** fits into the housing **12** to reduce bulk and readily lend itself to adaptation to space requirements. The tuning neck **32** is mounted within the outlet **22** such that noise and vibration are communicated directly to the resonator device **28**.

9 Claims, 2 Drawing Sheets



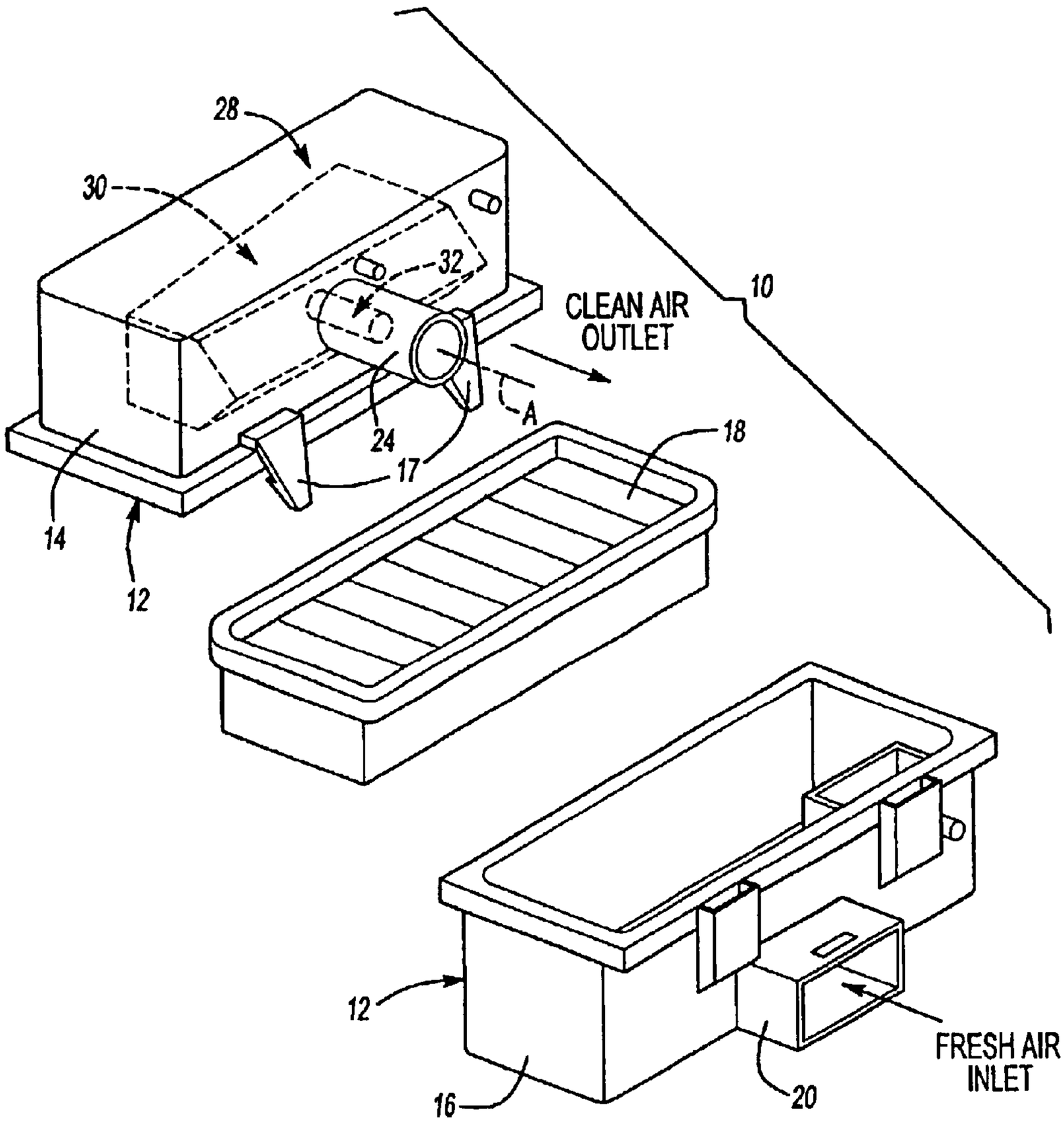

28
30
32
CLEAN AIR
OUTLET
10
A
24
17
18
14
12
12
16
20
FRESH AIR
INLET

Fig-1

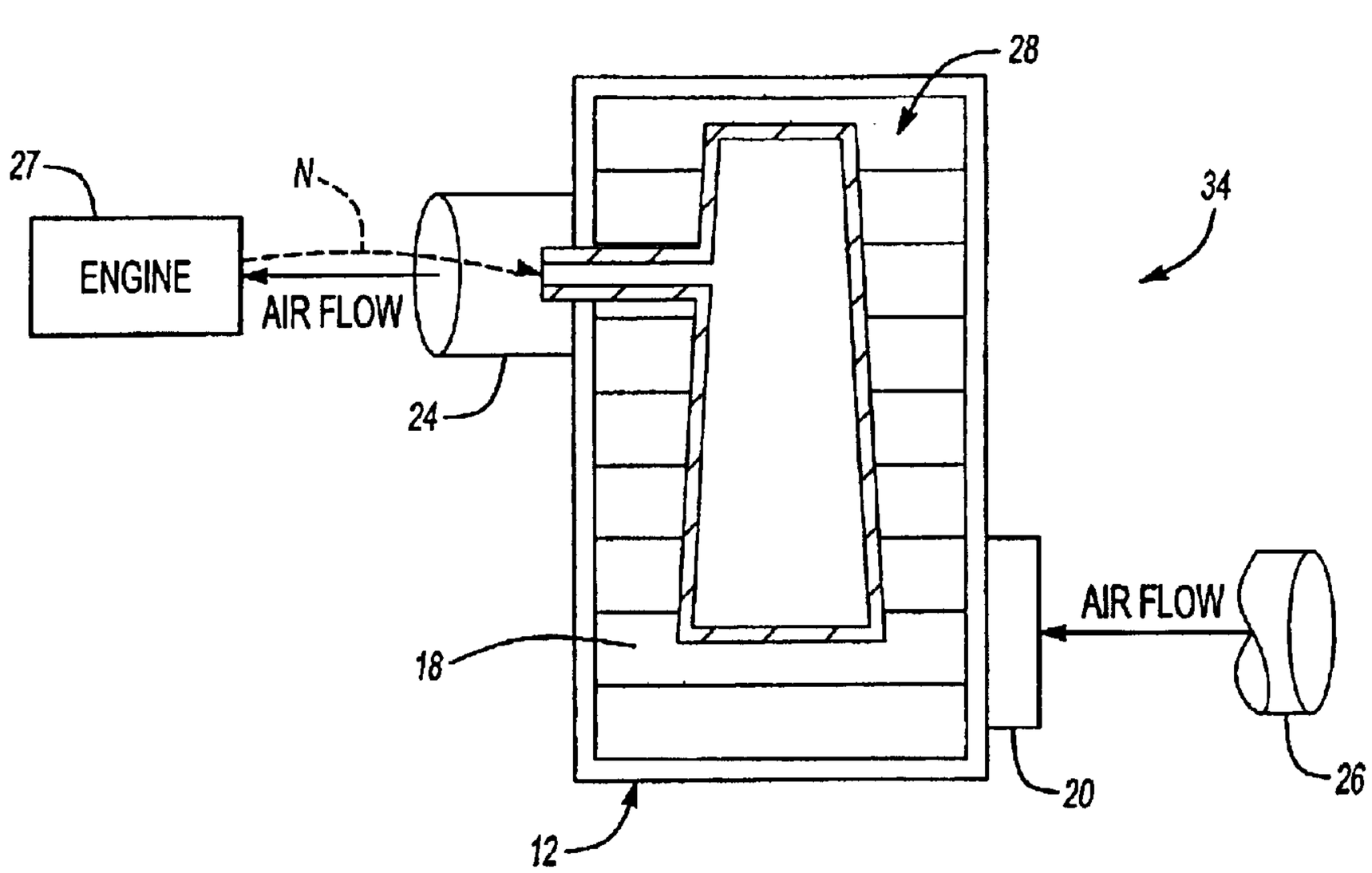


Fig-2

COMBINED AIR CLEANER RESONATOR

The present application claims priority to U.S. Provisional Patent Application Serial No. 60/346,912, filed Jan. 4, 2002.

BACKGROUND OF THE INVENTION

The present invention relates to an air introduction body, and more particularly to a vehicle air cleaner having an in-line resonator.

Manufacturers have employed various methods to reduce engine noise within a vehicle passenger compartment. Such noise frequently emanates from the engine, travels through the air induction system, and emanates into the passenger compartment.

Typically, a resonator chamber device communicates with the air induction system in order to reduce engine noise. The resonator device is mounted perpendicular to a vehicle induction system flow conduit. The resonator requires additional packaging space which may be at a premium in some vehicle installations.

Resonator devices include both expansion chamber and Helmholtz resonators which are designed to attenuate noise in particular frequency ranges. In an effort to simplify the air induction system and lower costs, the air cleaner sometimes includes a resonator chamber in the housing into which the air cleaner element is installed. Even where a resonator is integrated into an air cleaner housing, the resonator device comprises a separate component which must be connected into the induction system typically using hoses and clamps or otherwise requires a rather complicated communication path to achieve the perpendicular orientation.

Accordingly, it is desirable to provide an effective resonator system which requires minimum packaging space for utilization in relatively small locations.

SUMMARY OF THE INVENTION

The air cleaner assembly according to the present invention provides a housing constructed from a cover and a base. A filter such as a planar air filter is located within the housing between an air inlet and outlet thereby filtering airflow therebetween. The air inlet extends from the housing to communicate with an air intake port typically located at a vehicle location where fresh air is available.

A resonator device such as a Helmholtz device is mounted within the housing. The resonator device includes a resonator volume and a tuning neck. The resonator volume fits into the housing to reduce bulk and readily lend itself to adaptation to the space requirements. The tuning neck is mounted within and along an axis defined by the outlet. As the tuning neck is mounted within the outlet, noise and vibration are communicated directly to the resonator device to attenuate vehicle noise and vibrations without impacting the system packaging space. Moreover, no external connections are required to mount the resonator device into the air introduction system as heretofore required.

The present invention therefore provide an effective resonator system which requires minimum packaging space for utilization in relatively small locations.

BRIEF DESCRIPTION OF THE DRAWINGS

The various features and advantages of this invention will become apparent to those skilled in the art from the following detailed description of the currently preferred embodiment. The drawings that accompany the detailed description can be briefly described as follows:

FIG. **1** is an exploded view of an air introduction system according to the present invention; and

FIG. **2** is general schematic view of an air introduction system according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. **1** illustrates a general exploded view of an air introduction body **10** such as an air cleaner assembly **10** according to the present invention. The air cleaner assembly **10** includes a housing **12** which defines an interior space preferably constructed from a cover **14** and a base **16**. The cover **14** and base **16** are mounted together through one or more clips **17** or the like to form a unitary box-like structure. It should be understood that other shapes will benefit from the present invention.

The cover **14** and base **16** may be of a molded plastic such as nylon or polypropylene, and may be reinforced as required for a particular application. That is, the shape and size of the housing **12** are contemplated as being closely matched to the vehicle compartment in which they are located.

A filter **18** such as a planar air filter is located within the housing **12** between an air inlet **20** and outlet **22** thereby filtering airflow therebetween. The air inlet **20** extends from the housing **12** to communicate with an air intake port **26** (FIG. **2**) typically located at a vehicle location where fresh air is available. The air inlet **20** preferably extends from the base **16** of the housing **12**. The outlet **24** extends from the cover **14** to communicate filtered air from the inlet **20** to a vehicle power plant (illustrated schematically at **27**; FIG. **2**). It should be understood that other arrangements in which a filter is located between and inlet and outlet will benefit from the present invention.

A resonator device **28** such as a Helmholtz device is mounted within the housing **12**, preferably in the cover **14**. As generally, known, the resonator device **28** is typically tuned to attenuate vehicle noise and vibrations.

The resonator device **28** includes a resonator volume **30** and a tuning neck **32**. The resonator volume **30** fits into the cover **14** to reduce bulk and readily lends itself to adaptation to the space requirements of any housing **12**. The tuning neck **32** is preferably mounted within and along an axis A define by the outlet **24**. That is, the tuning neck **32** is mounted at least partially within the outlet **24**.

Referring to FIG. **2**, an air introduction system **34** including the air introduction body **10** intakes ambient air from the air intake port **26**, filters the air through filter **18** and communicate the clean airflow to the vehicle power plant **27**. As known, noise and vibration (illustrated schematically by arrow N) from the vehicle power plant **27** emanates through the air introduction system **34**. As the tuning neck **32** is mounted within the outlet **24**, noise and vibration N are communicated directly to the resonator device **28**. The resonator device **28** is therefore positioned to attenuate vehicle noise and vibrations without impacting the system packaging space. Moreover, no external connections are required to mount the resonator device **28** into the air introduction system **34** as heretofore required.

The foregoing description is exemplary rather than defined by the limitations within. Many modifications and variations of the present invention are possible in light of the above teachings. The preferred embodiments of this invention have been disclosed, however, one of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. It is, therefore, to

be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described. For that reason the following claims should be studied to determine the true scope and content of this invention.

What is claimed is:

1. An air introduction body for a vehicle air introduction system comprising:

an air cleaner housing comprising a cover and a base, said base comprising an inlet and said cover comprising and outlet; and

a resonator device mounted within said cover, said resonator device comprising a tuning neck located at least partially within said outlet.

2. The air cleaner assembly as recited in claim **1**, wherein said resonator comprises a resonator volume located within said housing.

3. The air cleaner assembly as recited in claim **2**, wherein said tuning neck is substantially perpendicular to said resonator volume.

4. The air cleaner assembly as recited in claim **1**, wherein said inlet and said tuning neck are substantially parallel.

5. A vehicle intake system comprising:

an air cleaner housing comprising a cover and a base, said base comprising an inlet and said cover comprising an outlet; and

a resonator device mounted within said cover, said resonator device comprising a tuning neck located at least partially within said inlet outlet.

6. The air clener assembly as recited in claim **5**, wherein said resonator comprises a resonator volume located within said air cleaner housing.

7. A The air cleaner assembly as recited in claim **5**, wherein said tuning neck is substantially perpendicular to said resonator volume.

8. The air cleaner assembly as recited in claim **5**, wherein said inlet and said tuning neck are located along a common axis.

9. The air cleaner assembly as recited in claim **5**, wherein said air cleaner housing comprises a cover and a base, said resonator device mounted within said cover.

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